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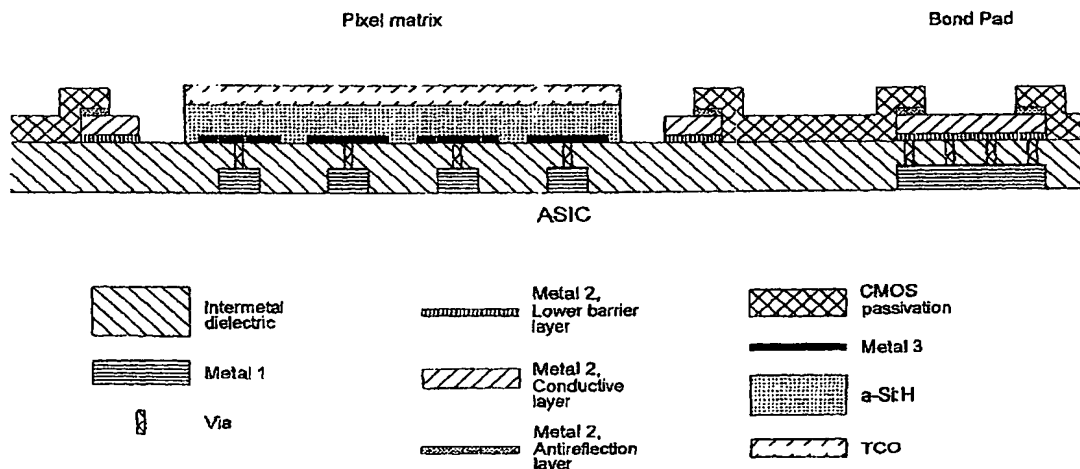
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(54) Title: TFA IMAGE SENSOR WITH STABILITY-OPTIMIZED PHOTODIODE



(57) Abstract: The invention relates to a TFA image sensor with stability-optimized photodiode for converting electromagnetic radiation into an intensity-dependent photocurrent with an intermetal dielectric, on which, in the region of the pixel matrix, a lower barrier layer (metal 2) is situated and a conductive layer (metal 2) is situated on said barrier layer, and vias being provided for the contact connection to the ASIC, said vias in metal contacts on the ASIC. The invention is based on the object of providing a TFA image sensor having improved electrical properties. This is achieved in that an intrinsic absorption layer (i) is provided between the TCO layer and the barrier layer (metal 2) with a layer thickness of between 300 nm and 600 nm. Before the application of the photodiodes, the topmost, comparatively thick metal layer of the ASIC is removed and replaced by a matrix of thin metal electrodes which form the back electrodes of the photodiodes, said matrix being patterned in the pixel raster.



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# INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER  
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According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 050 907 A (AGILENT TECHNOLOGIES INC) 8 November 2000 (2000-11-08) paragraph '0055!; figure 2 ---	1-19
X	WO 02 50921 A (SEIBEL KONSTANTIN ; SILICON VISION AG (DE); RIEVE PETER (DE); WALDE) 27 June 2002 (2002-06-27) page 7, line 25; claims 1-15; figure 2 ---	1-19
A	EP 1 045 450 A (AGILENT TECHNOLOGIES INC) 18 October 2000 (2000-10-18) the whole document ---	1
A	EP 0 428 050 A (FUJITSU LTD) 22 May 1991 (1991-05-22) column 5, line 45 -column 6, line 14 --- -/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>WO 99 00848 A (RIEVE PETER ; BOEHM MARKUS (DE)) 7 January 1999 (1999-01-07) abstract</p>	

# INTERNATIONAL SEARCH REPORT

International Application No.  
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Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 1050907	A	08-11-2000	US	6373117 B1	16-04-2002
			EP	1050907 A2	08-11-2000
			JP	2001007310 A	12-01-2001
WO 0250921	A	27-06-2002	AU	3580002 A	01-07-2002
			WO	0250921 A1	27-06-2002
			EP	1344259 A1	17-09-2003
EP 1045450	A	18-10-2000	US	6586812 B1	01-07-2003
			EP	1045450 A2	18-10-2000
			JP	2000340780 A	08-12-2000
			US	2003107100 A1	12-06-2003
EP 0428050	A	22-05-1991	JP	3150876 A	27-06-1991
			EP	0428050 A1	22-05-1991
			US	5093564 A	03-03-1992
WO 9900848	A	07-01-1999	WO	9900848 A1	07-01-1999
			EP	0935819 A1	18-08-1999